Introduction to Modelling

4. Function Examples

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https://github.com/JimDuggan/MATLAB

Challenge 4.1

Given the following matrices A and B, calculate results for the following operations in MATLAB, and explain the basis for your results.

$$A = \begin{pmatrix} 2 & 4 \\ 6 & 8 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$$

A * B;

A .* B;

A + B;

A .^ B;

General form of a function

- A function M-file *name*.m has the following general form

```
function[outarg1, outarg2, …] name(inarg1,...)
% comments to be displayed with help
…
outarg1 = ...;
outarg2 = ...;
...
```

Challenge 4.2

Write a function **evens(v)** which returns the even values of a vector. A sample test run of the function is shown below.

```
>> v

v =

    3    6    5    3    2    3    1    2    5    1

>> v1 = evens(v)

v1 =

    6    2    2
```

Challenge 4.3

Write a function (m file) that processes elements of a 2-dimensional array on a row-by-row basis. The function should return 2 column vectors, the first containing the minimum value for each row, the second containing the maximum value of each row.

Furthermore, min and max *subfunctions* should be written to calculate the min and max of an individual row (i.e. the MATLAB min and max cannot be used).

Sample data for the problem (1 input and 2 outputs) is shown below.

$$Input = \begin{pmatrix} 10 & 20 \\ 50 & 40 \\ 80 & 60 \end{pmatrix} \quad Min = \begin{pmatrix} 10 \\ 40 \\ 60 \end{pmatrix} \quad Max = \begin{pmatrix} 20 \\ 50 \\ 80 \end{pmatrix}$$

Challenge 4.4

- Explain what is happening in the following four lines of MATLAB code, and show what the values of y1 and y2 will be.

```
f1 = @max
f2 = @min
y1 = feval(f1,10,20);
y2 = feval(f2, 10, 20);
```

- What are the potential benefits of using @ and feval, and name a MATLAB function that makes use of these mechanisms.

Challenge 4.5

Write a function (m file) that takes a 2-dimensional array and an input number. It should then create an output 2-dimensional array that contains only those values of the 2-dimensional array that are greater than the input number. For example, if input number is 5, and the input array (A) is

```
A =
   1   2   3
   4   5   6
   7   8   9
```

Then the function output should be.

```
ans =
   0   0   0
   0   5   6
   7   8   9
```

Challenge 4.6

- Explain what is happening in the following MATLAB code, and determine the values (and type) of the output.

```
f = @(x) [sum(x); min(x); max(x)]

f(1:5)
```